REMARKS

Claim Rejections - 35 U.S.C. § 103

The Examiner has rejected claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over Lee (US Patent 6,077,337) in view of Watts et al. (US Patent 5,897,375).

It is Applicant's understanding that Li and Watts either alone or in combination fail to teach or render obvious Applicant's invention as claimed in claims 1-11. In claims 1-11, Applicant teaches and claims a method of polishing a copper layer by "**chemical mechanical polishing with a slurry comprising a chelating organic acid buffer system, colloidal silica and a low electrochemical potential oxidizer**". Applicant's have discovered that the combination of, such as H_2Q_2, and a chelating organic acid buffer system, such as citric acid and potassium citrate provides superior polishing results. The use of a low electrochemical potential oxidizer and a chelating organic acid buffer system enhances the copper removal rate to greater than 300Å per minute. Additionally, compatibility with low electrochemical potential oxidizers reduces the driving force for pitting and other forms of localized corrosion. It is Applicant's understanding that the cited fail to teach or suggest polishing with a slurry having a low electrochemical potential oxidizer and a chelating organic acid buffer system as claimed by Applicant.

It is Applicant's understanding that neither Lee nor Watts teaches or suggests polishing with a slurry having a low electrochemical potential oxidizer and a chelating organic acid buffer system. Lee teaches a slurry comprising two or more ferrocenium salt (Col. 4, lines 40-49), colloidal silica (Col. 5, lines 4-8) and a buffer

system comprising citric acid and potassium citrate (Col. 5, lines 9-14). Lee, however, fails to teach or suggest the use of a low electrochemical potential oxidizer, such as hydrogen peroxide as claimed by Applicant. It is to be appreciate that Lee utilizes one or more ferrocenium salts as the oxidizing agent. Ferrocenium has a very high electrochemical potential. Lee does not teach nor does his slurry achieve the benefits obtained by utilizing a low electrochemical potential oxidizer in combination with a chelating organic acid buffer system as claimed by Applicant.

Watts describes a slurry 24 which contains an oxidizing agent, such as H_2O_2, a carboxylate salt (e.g., citrate salt) and an abrasive (Col. 4, lines 54-Col 5, line 30). It is Applicant's understanding that Watts fails to teach a slurry comprising a chelating organic acid buffer system, such as citric acid and potassium citrate as claimed by Applicant. Therefore, Watts fails to teach or render obvious a slurry having a combination of a chelating organic acid buffer system and a low electrochemical potential oxidizer.

Additionally, one of ordinary skill of the art would not be motivated or inclined to add the hydrogen peroxide oxidizer of Watts into the slurry of Lee because Lee specifically teaches a slurry which is based upon ferrocenium salt as the oxidizer. Neither Watts nor Lee teach, suggest or hint at the benefits obtained by utilizing a low electrochemical potential oxidizer in combination with a chelating organic acid buffer system as claimed by Applicant. As such, for the above mentioned reasons it is Applicant's understanding that the cited references clearly fail to teach or render obvious Applicant's invention as claimed in claims 1-11. Applicant, therefore, respectfully requests the removal of the 35 U.S.C. §103 rejections of claims 1-11 and seeks an early allowance of these claims.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

1. (Amended) A method of forming copper interconnect, comprising:

forming a copper diffusion barrier layer in at least a damascene structure;

forming a copper layer over the barrier layer;

removing a portion of the copper layer by chemical mechanical polishing with a slurry comprising a chelating organic acid buffer system, colloidal silica, and **[an]** **a low electrochemical potential** oxidizer.

6. (Amended) A method of forming copper interconnect, comprising:

forming a barrier layer over a substrate having at least one trench therein;

forming a copper seed layer on the surface of the barrier layer;

forming a copper layer over the barrier and seed layers;

removing a portion of the copper layer by chemical mechanical polishing with a first slurry comprising a chelating organic acid buffer system, colloidal silica, and **[an]** **a low electrochemical potential** oxidizer; and

removing at least a portion of the barrier layer by chemical mechanical polishing with a second slurry comprising a chelating organic acid buffer system, and colloidal silica;

wherein the second slurry is formed without the oxidizer.